# Apros® Nuclear - Success stories

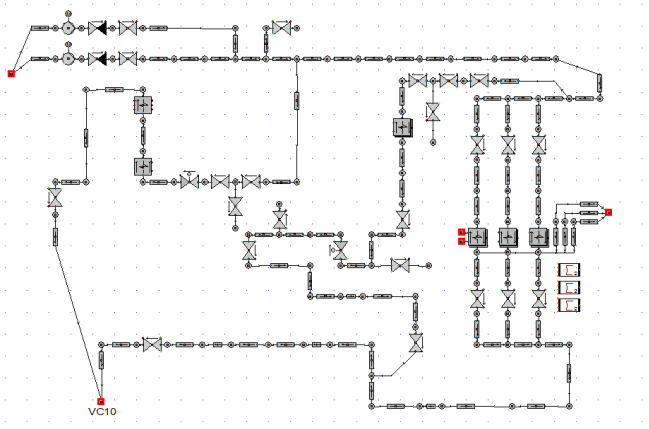
## Loviisa case 4: Modelling and analysis of Loviisa auxiliary seawater cooling circuit

**The aim is to simplify the structure and operation of the VF-cooling system. Using Apros® simulation model for example different sizes and configurations of orifice plates can be investigated easily and effectively.**

The Loviisa nuclear power plant auxiliary seawater cooling circuit (VF) was partially renewed in both units (LO1&2) during 2012 - 2014. The aim for the project was to simplify the structure and operation of the VF-system. The VF-cooling system provides cooling water for various consumers such as intermediate component cooling system (TF), reserve residual heat removal system (RR), air-conditioning systems etc.

The VF-cooling system has to fulfill multiple thermal hydraulic related requirements regarding for example mass flows and pressure levels. In order to achieve these requirement also after the installation work, a simulation model was created to validate the new design. With the help of simulation model, it was soon discovered that the dimensions of existing flow restrictors in the system were not suitable to meet the given requirements.

The dimensioning of new orifice plates proved to be challenging since process changes in one part of the system has an effect to other cooling water consumers.




Therefore it was essential to investigate the process as a whole rather than focusing at individual consumers. In addition, the requirements for pressure levels and mass flows were in some cases in contradiction with each other. For example, in order to achieve the desired pressure level, the flow should be restricted to extend that the requirement for mass flow is not met.

Without a good simulation model this task would have been practically impossible considering the complexity of the system and demanding requirements. However, using a simulation model different sizes and configurations of orifice plates could be investigated easily and effectively. This made it possible to find an optimal design for the system. The new orifice plates and other process changes were successfully implemented for both units during the project.

### Loviisa nuclear power plant, Finland

**Loviisa nuclear power plant has two VVER pressurised water reactors, Loviisa 1 and Loviisa 2, with capacities of 498 MW net and 500 MW net. Loviisa 1 was commissioned in 1977 and Loviisa 2 in 1980. The operating licence for Loviisa 1 is valid until 2027 and Loviisa 2 until 2030.**
**In 2015 the production of the power plant totalled 8.47 TWh, i.e. about 13% of Finland's electricity production.**
**Nuclear power has a central role in Fortum's CO2-free production and continues to have a long-term role in the transition towards the Solar Economy.**

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